REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claims 3 and 9 have been canceled. Claims 1 and 7 have been amended to define the first, second and third basic image patterns as respectively corresponding to an image obtained when the focal position of the camera is set at the tip of the abrasive grain, at the bottom of the abrasive grain, and at the tip and bottom of the abrasive grain. Basis for this is found, for example, in Figures 4A-4C and at page 14, lines 4-12.

The claimed invention is directed to a measuring method or apparatus for a grinding tool using a camera, wherein images are picked up and a focal position of the camera is moved in a direction perpendicular to the grinding surface. The resulting image data is compared to a predetermined basic image pattern. The amount of projection of the abrasive grains on the grinding tool is then calculated based on the focal position at which the detected image data was obtained by the camera.

For example, referring to the non-limiting embodiment illustrated in the figures, image data may be obtained with the camera at focal positions within the ranges L_A, L_B and L_C (Figure 3B). When the focal position is within the range L_A, it is within the range containing the tip of the abrasive grains 20, so that the image data is of the tips of the grains 20 having a quasi-cylindrical contour (Figure 4A). When the focal position is in the range L_B, the image data has a donut shaped contour (Figure 4B). When the focal position is within a range L_C, it is within the range containing the bottom of the abrasive grain, and so the image data is similar to that shown in Figure 4C. The memory 72 stores a first basic image pattern V_A corresponding to the tip of the abrasive grain, a second basic image pattern V_C corresponding to the bottom of the abrasive grain, and a third basic image pattern V_B corresponding to a focal position set at the tip and bottom of the abrasive grain. The controller then compares each of the basic image patterns with the digital image data obtained

at each focal position and extracts digital image data having the smallest difference from the first and second basic image patterns in order to calculate the amount of projection of the abrasive grains (paragraph bridging pages 14-15).

Moreover, according to this embodiment, the memory 72 additionally stores the third basic image pattern V_B (page 14, lines 4-12), and the controller 60 compares the read image data with the basic image patterns which include the third basic image pattern V_B.

Storing and using the third basic image pattern V_B provides advantages for measuring the grinding surface of a grinding tool. The height of the abrasive grains is not always even and is discrete. Thus, depending on the initial position of the focal position of the camera, image data corresponding to a first basic image pattern sometimes cannot be detected. However, if image data corresponding to the third basic image pattern can be detected, it can be judged that the initial position of the focal position is too close to the grinding surface. Then, based on the result of the judgment, the initial position of the focal position can be moved farther away from the grinding surface, and it becomes possible to carry out the operation of reading image data again. In the above manner, image data corresponding to the first basic image pattern can invariably be detected and the height of the abrasive grains can be calculated.

Depending on the grindstone, the bonding agent for bonding the abrasive grains to the grinding surface may have projections and depressions, and there are cases in which the top of the projection is detected as image data corresponding to the first basic image pattern. In used grindstones, there are cases when the tops of chips and the like adhered to the grinding surface as a result of a grinding process are detected as image data corresponding to the first basic image pattern. However, generally, the shape of abrasive grains is different from the projections and depressions of a bonding agent and the shape of the chips are random and mostly differ from the shape of abrasive grains. Thus, it is possible to determine the amount

of projection of the abrasive grains with high precision by using the third basic image pattern to detect image data at the middle portion of the abrasive grain.

Claims 1-12 were rejected under 35 U.S.C. §103 as being obvious over Japanese patent publication 10-260016 (Kato et al.) in view of Japanese patent publication 3-239469 (Yoshioka). Applicant respectfully submits that the amended claims define over this prior art.

Kato et al. discloses a system used for the inspection of a semiconductor, and not a measuring method or apparatus for a grinding tool. Therefore, at least with respect to the method Claims 7-12, Kato et al. provides no teaching for the claimed subject matter (M.P.E.P. §2116; "The materials on which a process is carried out must be accorded weight in determining the patentability of a process"). Moreover, the elements and steps of Kato et al. are significantly different from the claimed features. For example, in order to inspect the surface of a semiconductor, Kato et al. provides reference marks 33-35 on the substrate 30 and the pattern elements 31 formed thereon. Kato et al. therefore changes the focus position of a camera and, for each position, matches the pattern of a picked up image with that of a template to determine the top of the pattern and the substrate heights by matching the marks of the images with the templates (paragraphs [0012] and [0016]). Significantly, there is no teaching in Kato et al. of means for storing a *third* basic image pattern in which the focal position is set at the tip and bottom of an abrasive grain, or of means for comparing the image data with such a third basic image pattern and detecting the image data approximate to the third image pattern on the basis of the comparison. The amended claims thus clearly define over Kato et al. which is silent as to the claimed third basic image pattern.

Yoshioka, unlike Kato et al., is directed to the measurement of a grinding tool using a camera but otherwise provides no teaching with respect to the claimed invention. According to Yoshioka, the wear of abrasive grains on a grinding tool is detected by the processing of

photographic images. However, there is no teaching of comparing stored images obtained at certain focal positions with a third basic image pattern. Yoshioka is thus incapable of providing a suggestion for modifying Kato et al. to include a third basic image pattern. The amended claims are therefore believed to clearly define over any combination of the above references.

Applicant therefore believes that the present application is in a condition for allowance and respectfully solicits an early notice of allowability.

Respectfully submitted,

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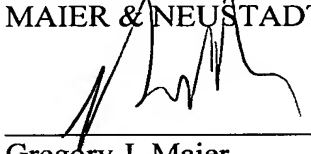

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